

WHAT IS CLAIMED:

1. A process for the treatment of an aqueous solution containing waste comprising the steps of:

providing an influent wastewater stream to an anaerobic conditioner zone within which aqueous total solids are

5 recirculated, mixed and kept in suspension;

providing low oxygen level mixed liquor suspended solids from an anoxic selector zone to the anaerobic conditioner zone to maintain a low dissolved oxygen level within the anaerobic conditioner zone;

10 providing an outflow from the anaerobic conditioner zone to a first aerobic reactor zone, the anaerobic conditioner zone outflow being mixed in the first aerobic reactor zone with return activated sludge from a clarification zone whereby contents of the first aerobic reactor zone are recirculated and  
15 aerated, and whereby settleable solids present in the contents of the first aerobic reactor zone are fractionalized, thereby decomposing and oxidizing the solids and other organic matter and accumulating inert solids;

20 discharging the accumulated inert solids from the first aerobic reactor zone;

providing an outflow of aqueous solution from the first aerobic reactor zone to the anoxic selector zone wherein the aqueous solution in the anoxic selector zone is recirculated and mixed;

25       transferring a first portion of the anoxic selector zone aqueous solution corresponding to the low oxygen level/mixed liquor suspended solids to the anaerobic conditioner zone, and a second portion of the anoxic selector zone aqueous solution to a second aerobic reactor zone;

30       recirculating and aerating aqueous solution contained in the second aerobic reactor zone whereby settleable solids become fractionalized thereby decomposing and oxidizing suspended solids and other organic matter;

      providing a first portion of the second aerobic reactor  
35       zone aqueous solution to the first aerobic reactor zone;

      providing a second portion of the second aerobic reactor zone aqueous solution to the clarification zone to settle or separate solids from the aqueous solution contained therein;

      providing the settled or separated solids from the  
40       clarification zone, corresponding to return activated sludge, to the first aerobic reactor zone;

providing aqueous solution of the clarification zone to a filtration zone to settle or separate solids from the aqueous solution provided thereto; and

45       transferring a liquid portion of an outflow of the filtration zone to a discharge receptacle, and the settled or separated solids portion of the outflow of the filtration zone to the influent wastewater stream for re-processing.

2. A process for the biological treatment of an aqueous solution containing waste to reduce organic material, nitrogen and phosphorus, comprising the steps of:

5       providing an influent wastewater stream, which includes microorganisms, to an anaerobic conditioner zone within which aqueous total solids are recirculated, mixed and kept in suspension, wherein a first stage of luxury phosphorus uptake is accomplished by regulating a flow of low oxygen level mixed  
10   liquor suspended solids from an anoxic selector zone to the anaerobic conditioner zone to maintain a low dissolved oxygen level within the anaerobic conditioner zone;

providing an outflow from the anaerobic conditioner zone to a first aerobic reactor zone, the anaerobic conditioner zone  
15   outflow being mixed in the first aerobic reactor zone with return activated sludge received from a clarification zone

whereby contents of the first aerobic reactor zone are recirculated and aerated and whereby nitrification occurs and settleable solids present in the contents of the first aerobic reactor zone are fractionalized, thereby decomposing and oxidizing suspended solids and other organic matter along with enhancing a second stage of luxury phosphorus uptake and accumulating inert solids;

discharging the accumulated inert solids from the first aerobic reactor zone;

providing an outflow of aqueous solution from the first aerobic reactor zone to the anoxic selector zone wherein the aqueous solution in the anoxic selector zone is recirculated and mixed, and causing a low oxygen environment to exist within the anoxic selector zone such that denitrification and release of biological phosphorus occurs along with the consumption of organic matter contained within the aqueous solution;

transferring a first portion of anoxic selector zone aqueous solution corresponding to low oxygen level/mixed liquor suspended solids to the anaerobic conditioner zone and a second portion of the anoxic selector zone aqueous solution to a second aerobic zone, at least the second portion of the anoxic selector zone aqueous solution being rich in microorganisms and nutrients;

40 re-circulating and aerating aqueous solution contained in  
the second aerobic reactor zone whereby nitrification occurs and  
settleable solids become fractionalized thereby decomposing and  
oxidizing suspended solids and other organic matter, and further  
enhancing the second stage of luxury phosphorus uptake resulting  
45 in a consumption of a large amount of phosphorus by the  
microorganisms;

providing a first portion of the second aerobic reactor  
zone aqueous solution to the first aerobic reactor zone;

providing a second portion of the second aerobic reactor  
50 zone aqueous solution to the clarification zone to settle or  
separate solids from the aqueous solution provided thereto;

providing the settled or separated solids from the  
clarification zone to the first aerobic reactor zone as return  
activated sludge;

55 providing aqueous solution of the clarification zone to a  
filtration zone to settle or separate solids from the aqueous  
solution provided thereto; and

transferring a liquid portion of an outflow of the  
filtration zone to a discharge receptacle and the settled or  
60 separated solids portion of the outflow of the filtration zone  
to the influent wastewater stream for re-processing.

3. Apparatus for the treatment of an aqueous solution containing waste comprising:

an anaerobic conditioner zone fluidly coupled to an inlet, the anaerobic conditioner zone receiving an influent wastewater stream through the inlet, the anaerobic conditioner zone recirculating the wastewater contained therein such that aqueous total solids are kept in suspension, the anaerobic conditioner zone receiving a flow of low oxygen level mixed liquor suspended solids from an anoxic selector zone to maintain a low dissolved oxygen level within the anaerobic conditioner zone;

a first aerobic reactor zone fluidly coupled to the anaerobic conditioner zone, the first aerobic reactor zone receiving an outflow of the anaerobic conditioner zone which is mixed with return activated sludge received from a clarification zone whereby contents of the first aerobic reactor zone are recirculated and aerated and whereby settleable solids become fractionalized thereby decomposing and oxidizing suspended solids and other organic matter, the first aerobic reactor zone accumulating inert solids, the accumulated inert solids being discharged from the first aerobic reactor zone;

an anoxic selector zone fluidly coupled to the anaerobic conditioner zone and the first aerobic reactor zone, the anoxic

selector zone receiving an outflow of aqueous solution from the first aerobic reactor zone, aqueous solution within the anoxic selector zone being recirculated and mixed, a first portion of the anoxic selector zone aqueous solution, corresponding to the low oxygen level/mixed liquor suspended solids, being provided to the anaerobic conditioner zone;

a second aerobic reactor zone fluidly coupled to the anoxic selector zone and the first aerobic reactor zone, the second aerobic reactor zone receiving a second portion of the anoxic selector zone aqueous solution wherein the aqueous solution within the second aerobic zone is recirculated and aerated, whereby settleable solids become fractionalized, a first portion of the aqueous solution of the second aerobic reactor zone being provided to the first aerobic reactor zone;

a clarification zone fluidly coupled to the second aerobic zone and the first aerobic zone; the clarification zone receiving a second portion of the second aerobic reactor zone aqueous solution, whereby settling or separating and capturing of solids from the aqueous solution occurs, and the settled solids, corresponding to return activated sludge, are provided to the first aerobic reactor zone; and

a filtration zone fluidly coupled to the clarification zone, the inlet, and an outlet, the filtration zone receiving an

outflow from the clarification zone to separate solids from the liquid portion of the contents of the clarification zone, a first portion of the contents of the filtration zone, which corresponds to effluent, being provided to the outlet, and a

50 second portion of the contents of the filtration zone, which corresponds to separated solids, being provided to the inlet and being combined with the influent wastewater stream for re-processing.